

What is claimed is:

1 An article molding assembly including a mold and a release mechanism for releasing molded articles from the mold, the mold including a first mold portion, a second mold portion movable with respect to the first mold portion, and a third mold portion movably interposed between the first and second portions and having at least one pair of space defining surfaces which together with the first and second mold portions defines in a closed position at least one space for receiving plastic material injected therein to form at least one molded article, the second and the third mold portions being movable

5 away from the first mold portion to permit removal of the at least one molded article from the first mold portion, the second mold portion being movable away from the third mold portion to remove the at least one molded article from the second mold portion, the release mechanism operating to release the at least one molded article from the third mold portion and comprising:

10 15 a guide coupled to the second mold portion forming a cam track; a cam follower coupled to the at least one pair of space defining surfaces of the third mold portion and engaged in the cam track at least when the second and third mold portions are within a pre-selected distance of each other, the cam follower interacting with the cam track to cause relative

20 movement of each pair of space defining surfaces, the cam follower being engaged in a first portion of the cam track when the mold portions are in the closed position, the first portion of the cam track also including a ramp to an intermediate portion defining a pre-release position of each pair of space defining surfaces so that the at least one molded article is loosely retained by

25 the space defining surfaces; and

28 a power operator carried by the third mold portion and coupled to the space defining surfaces, the power operator being responsive to a signal to move each pair of space defining surfaces from the pre-release position to a full release position.

2. An article molding assembly including a mold, a molded article receiver for receiving molded articles from the mold, and a release mechanism for releasing molded articles from the mold, the mold having a first mold portion, a second mold portion movable with respect to the first mold portion, and a third mold portion movably interposed between the first and second portions and having at least one pair of space defining surfaces which together with the first and second mold portions defines in a closed position at least one space for receiving plastic material injected therein to form at least one molded article, the second and the third mold portions being movable

5 away from the first mold portion to permit removal of the at least one molded article from the first mold portion, the second mold portion being movable away from the third mold portion to remove the at least one molded article from the second mold portion, the release mechanism comprising:

10 a guide coupled to the second mold portion forming a cam track;

15 a cam follower coupled to the at least one pair of space defining surfaces of the third mold portion and engaged in the cam track at least when the second and third mold portions are within a pre-selected distance of each other, the cam follower interacting with the cam track to cause relative movement of each pair of space defining surfaces, the cam follower being

20 engaged in a first portion of the cam track when the mold portions are in the closed position, the first portion of the cam track also including a ramp to a second portion, the second portion defining a pre-release position of each pair of space defining surfaces so that the at least one molded article is loosely retained by the space defining surfaces; and

25 a power operator carried by the third mold portion and coupled to the space defining surfaces, the power operator being responsive to a signal indicating the relative position of the third mold portion and said molded article receiver to move each pair of space defining surfaces from the pre-release position to a full release position.

3. The article molding assembly of either of claims 1 or 2 wherein the guide includes a first end containing the first portion of the cam track and a second end including the second portion, the second end having an opening so that the cam follower can move outside the cam track.

5 4. The article molding assembly of either of claims 1 or 2 wherein the guide includes an inclined surface adapted to contact the cam follower as the third mold portion moves from the full release position toward the second mold portion for returning the space defining surfaces to a closed position.

5 5. The article molding assembly of either of claims 1 or 2 wherein 10 the power operator comprises a fluid operated apparatus.

6. The article molding assembly of claim 5 wherein the fluid operated apparatus comprises an air cylinder operable at least in one direction to move the space defining surfaces to the full release position.

7. The article molding assembly of claim 2 wherein said molded 15 article receiver includes at least one corresponding receiver tube alignable with each pair of space defining surfaces for receiving the at least one molded article, and at least one sensor for detecting any deposition of a molded articles into a receiver tube, the sensor being coupled to a signal source for sending said signal to said power operator.

20 8. The article molding assembly of claim 7 wherein each receiver tube comprises an open forward end configured to receive a molded article, a closed rearward end including a surface contact element movably situated with respect to the forward end and configured to conform to a portion of the surface of the molded article, a vacuum duct coupling the closed rearward end to a source of vacuum for assisting in the retention of a molded article within the receiver tube, an air cylinder coupled to the surface contact element, and a pressure duct coupling each air cylinder to a source of air pressure for controlling the position of the surface contact element with respect to the forward end.

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9. A method for releasing molded articles from a mold, the mold having a first mold portion, a second mold portion movable with respect to the first mold portion, and a third mold portion movably interposed between the first and second portions and having at least one pair of space defining surfaces which together with the first and second mold portions defines in a closed position at least one space for receiving plastic material injected therein to form at least one molded article, the second and the third mold portions being movable away from the first mold portion to permit removal of the at least one molded article from the first mold portion, the second mold portion being movable away from the third mold portion to remove the at least one molded article from the second mold portion; the method comprising the steps of:

- 5 providing a guide coupled to the second mold portion forming a cam track;
- 10 providing a cam follower coupled to the at least one pair of space defining surfaces of the third mold portion;
- 15 engaging the cam follower in the the cam track at least when the second and third mold portions are within a pre-selected distance of each other, the cam follower interacting with the cam track to cause relative movement of each pair of space defining surfaces, the cam follower being engaged in a first portion of the cam track when the mold portions are in the closed position;
- 20 moving the cam follower to a second portion of the cam track including a ramp defining a pre-release position of each pair of space defining surfaces so that the at least one molded article is loosely retained by the space defining surfaces; and
- 25 providing a signal to a power operator carried by the third mold portion and coupled to the space defining surfaces, the signal causing the power operator to move each pair of space defining surfaces from the pre-release

position to a full release position for releasing the molded article from the third mold portion.

10. A method for releasing molded articles from a mold into a molded article receiver, the mold having a first mold portion, a second mold portion movable with respect to the first mold portion, and a third mold portion movably interposed between the first and second portions and having at least one pair of space defining surfaces which together with the first and second mold portions defines in a closed position at least one space for receiving plastic material injected therein to form at least one molded article, the second and the third mold portions being movable away from the first mold portion to permit removal of the at least one molded article from the first mold portion, the second mold portion being movable away from the third mold portion to remove the at least one molded article from the second mold portion; the method comprising the steps of:

15 providing a guide coupled to the second mold portion forming a cam track;

providing a cam follower coupled to the at least one pair of space defining surfaces of the third mold portion;

engaging the cam follower in the the cam track at least when the second and third mold portions are within a pre-selected distance of each other, the cam follower interacting with the cam track to cause relative movement of each pair of space defining surfaces, the cam follower being engaged in a first portion of the cam track when the mold portions are in the closed position;

20 moving the molded article receiver in between the first and second mold portions and into proximity with the third mold portion;

moving the third mold toward the molded article receiver so that the cam follower moves to a second portion of the cam track including a ramp defining a pre-release position of each pair of space defining surfaces wherein

the at least one molded article is loosely retained by the space defining surfaces; and

providing a signal from the molded article receiver to a power operator carried by the third mold portion and coupled to the space defining surfaces,
5 the signal causing the power operator to move each pair of space defining surfaces from the pre-release position to a full release position for releasing the molded article from the third mold portion into the molded article receiver.

11. The method of claim 10 further comprising the steps of
providing the molded article receiver with at least one corresponding
10 receiver tube alignable with each pair of space defining surfaces for receiving the at least one molded article, and

providing at least one sensor for detecting any deposition of a molded articles into a receiver tube, the sensor being coupled to a signal source for sending said signal to said power operator.

15 12. The method of claim 11 further comprising the steps of
providing within each receiver tube an open forward end configured to receive a molded article, a closed rearward end including a surface contact element movably situated with respect to the forward end and configured to conform to a portion of the surface of the molded article, and an air cylinder
20 coupled to the surface contact element, and

providing sufficient air pressure to the air cylinder to bias the surface contact element toward the open forward end of the receiver tube.

13. The method of claim 12 further comprising the steps of
coupling the closed rearward end of the receiver tube to a source of
25 vacuum, the vacuum being insufficient to overcome the bias provided to the surface contact element by the air pressure within the air cylinder when no molded article is present within the receiver tube, and
using the vacuum to assist in locating a molded article within the receiver tube in contact with the surface contact element.

14. The method of claim 13 further comprising the steps of:
providing said signal from the molded article receiver to said power operator to cause movement of each pair of space defining surfaces from the pre-release position to a full release position only after the molded article is in
5 contact with the surface contact element
restricting the supply of air pressure within the air cylinder , and
allowing the vacuum to displace the surface contact element and
molded article toward the receiver tube closed end thus uncoupling the
molded article from the third mold portion.

10 15. The method of any of claims 12 to 14 further comprising the steps of:
withdrawing the molded article receiver from between the first and
second mold portions, and
providing the air cylinder with sufficient air pressure to displace the
15 surface contact element toward the open end with sufficient speed to eject the
molded article from the receiver tube.

16. The method of any of claims 9 to 14 further comprising the steps of:
providing said guide with a first end containing the first portion of the
20 cam track, a second end including the second portion, and an opening in the
second end, and
moving the cam follower through the opening and outside the cam
track prior to providing said signal to said power operator carried by the third
mold portion that causes the power operator to move each pair of space
25 defining surfaces from the pre-release position to a full release position.

17. The method of claim 16 further comprising the steps of
moving the third mold portion toward the second mold portion
subsequent to release of each molded article from each pair of space defining
surfaces so that the cam follower re-enters the cam track and

providing the guide with an inclined surface adapted to contact the cam follower as the third mold portion moves from the full release position toward the second mold portion for returning the space defining surfaces to a closed position.

5 18. A guide for use in controlling the relative position of at least one pair of space defining surfaces which, together with a first and second mold portions, defines in a closed position at least one space for receiving plastic material injected therein to form at least one molded article, the guide comprising:

10 a first portion having a closed end and including a pair of sides defining a cam track, the sides in the first portion being spaced sufficiently from each other to accommodate a cam follower when the mold portions are in the closed position, the first portion also including a ramp leading to an intermediate portion, the intermediate portion defining a pre-release position
15 for each pair of space defining surfaces so that the at least one molded article is loosely retained by the space defining surfaces, one of the sides in the intermediate portion being inclined away from the other side toward a second portion including a second portion including an open end so that the cam follower can move outside the space between the sides of the cam track, the
20 inclined away surface being adapted to contact the cam follower as the third mold portion moves from the full release position toward the second mold portion for returning the space defining surfaces to a closed position.

19. A movable contact element for use in a thermal modification unit for molded articles, the contact element comprising a piston adapted to be moved within a sleeve, the piston having a generally concave distal surface adapted to reflect a corresponding surface of said molded articles, an outer cylindrical surface adapted to facilitate linear movement of the piston within the sleeve, an opening through the piston from the concave distal surface to a proximal surface to permit a vacuum to be communicated to the concave surface, the opening including a portion adapted to accept a blocking plug.
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20. The movable contact element of claim 19 further comprising a stem connection portion projecting rearward from the proximal surface including a threaded opening for connection to a motion control element.

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